13 SUMMARY AND RECOMMENDATIONS

13.1 Water/Waste Water Systems

Based on the age of the sanitary sewers, the materials and construction methods commonly used when the systems were built, and the lack of regular maintenance and repairs, it is anticipated that the sewers are in a generally deteriorated condition and need replacement. For a sanitary sewer component to be kept, additional assessment would be needed. This would likely include limited flow monitoring to quantify infiltration and inflow and to determine system capacities; smoke testing to identify specific sources of inflow; and closed-circuit television inspection to identify infiltration sources and structural damage.

Lift Stations: Each of the lift stations was found to be unacceptable. The lift stations would require, at a minimum, additional reliable pumping capacity, new instrumentation and controls, a functional alarm system, and standby power facilities in order to be adequate. In addition, the structures housing the pump stations are often substandard and/or damaged. These conditions make these lift stations unreliable; coupled with the location of many of the stations, the risk of failure leading to contamination of the lake is considered very high. New lift stations should be constructed using new equipment and materials.

Force Mains. The force mains connecting these lift stations to the ponds are also questionable. The force mains should also be replaced. These new facilities should be located and sized in conformance with planned future uses of the resorts.

Ponds: The wastewater retention ponds are considered to be undersized for the current resort development. This conclusion is based on the presence of discrete overflow pipes, implementation of spray disposal fields, and reports of the ponds being overtopped. Spray disposal that is being performed should be ceased immediately because the wastewater that is being discharged is minimally treated (spraying occurs during peak usage), the wastewater is not disinfected, and the potential for human pathogenic contact is very high. Additional ponds are needed such that proper operation can be achieved.

Miscellaneous. Numerous problems such as exposed polyvinyl chloride pipe (susceptible to ultraviolet degradation and failure), non-operating pumps, and spray mister heads that should be replaced were observed. Exposed electrical wiring represents a safety hazard and should be corrected immediately. Maintenance activities such as weed removal and clay-lining repairs should be performed at many of the ponds.

The wastewater treatment strategy that has been implemented at Steele Park – contract operation of a secondary treatment facility by Napa County – should receive further consideration for the other resorts. It is recommended that a study be completed to evaluate the benefits of improving the ponds at each of the various facilities vs. construction of a larger treatment plant located somewhere on the western side of the lake. Various combinations of these strategies, for example constructing a wastewater treatment plant to process the wastewater generated at the resorts between Rancho Monticello and Spanish Flat Resort, with improvements to the ponds at Putah Creek Resort completed separately, should be a part of the study. Preliminary siting of any combined treatment facility should also be included.

13.1.1 Water Systems

Distribution Systems: Residual chlorine testing at the taps must be conducted before any upgrades to the water treatment or storage facilities are planned. For systems to be retained, verification of minimal leakage is needed. Leak testing can be performed with pressure measurements at the fire hydrants, and the upgrade should include the elimination of system leaks, determination of fire fighting pressures, and verification of adequate treatment.

Treatment Facilities: In general, the structures housing the water treatment facilities are of a higher quality than the wastewater lift station structures. The pressure filters were found to be relatively new and in reasonable condition. The chlorine analyzers, the turbidimeters, and the feed pumps were also new and/or in good condition.

Recommended improvements include additional onsite storage tanks to extend the chlorine contact times, storage tanks and better mixers to increase the effectiveness of the polymer solution for turbidity removal, and the addition of standby power (except at Rancho Monticello, which already has a diesel generator). Significant improvements to the instrumentation, monitoring, and alarm systems are needed. Containment structures for the backwash water, with discharge to the sanitary sewer system, are also recommended.

Steele Park and Spanish Flat Resort already obtain their water supplies from offsite sources. This strategy should be considered for the other resorts on the west side of the lake, as well. One possibility would be to combine all of the pressure filters from each of the resorts into one location. Based on the demand requirements of the future developments, additional filters might also be required. The instrumentation and control improvements, alarm system, additional tanks, standby power, and backwash improvements would still be required, but the requirements for a single facility (as opposed to several) would be fewer.

Storage Tanks: It was not possible to inspect the interior of the water tanks during our inspections, but many of the storage tanks were observed to be leaking. A program for repairing the leakage is needed. Reinforcing cables were often displaced and structural damage was visible on one tank at Rancho Monticello. Exposed piping should be protected from vandalism and freezing. Valves should be exercised regularly and repaired when leaking.

13.1.2 Water/Waste Water Management Strategies

It is recommended that the Bureau consider formation of a Maintenance District to operate and maintain both the water and wastewater systems. In this manner, appropriately trained and licensed personnel would be responsible for water treatment and distribution, water quality monitoring and testing, and wastewater collection, treatment, and disposal.

Licensing requirements for the wastewater facilities would include a Grade IV or V Wastewater Treatment Operator. For the water system, a Grade III or IV Water Treatment Operator would be required. The licensed operators and staff could be Bureau of Reclamation employees, could be Napa County employees, or could be provided on a contract basis with one of the companies that provides contract operations services for water and wastewater treatment facilities. The cost of the Maintenance District could be included in future lease agreements.

13.2 Boat Launch Ramps

The boat launch ramps located at the resorts are generally in fair condition, however, as constructed, the boat launch ramps do not uniformly meet the current California Boating and Waterways Guidelines criteria for minimum 6" slab thickness for the freshwater lake application. They are typically of a thickness less than the recommended amount. Several of the ramps exceed the recommended 15 percent slope and are constructed with materials other the recommended Portland cement concrete. It is not clear whether steel reinforcing is present in the concrete ramps as a minimum steel ratio is recommended. The Guidelines also recommend the use of V-grooves to ensure traction for the hauling vehicles. Due to deterioration of the concrete, or simply the lack of, the ramps generally do not meet this requirement.

Although not specifically recommended by the guidelines, the use of a curb defining the boundaries of the launch ramp is advised to avoid damage to the adjacent ground by vehicles.

Some of the ramps are displaying obvious deterioration of the topping or slab, with erosion of the underlying sub-base present in a few previously noted cases along the perimeters of the ramp. There are also cracks or spalling in almost all of the ramps with concrete surfaces. These defects should be repaired to maintain the integrity of the concrete and the underlying material.

The width of the ramps is adequate, and in most cases there appears to be clearance for vehicles at the top of the ramp.

In general, on-shore signage for the launch ramps is not provided and would be a benefit to the recreational boaters. In many cases, buoys were absent defining a five mile per hour zone to prevent excessive wake and to define a boundary between the swimming area and the fairway for the launch ramp as stated in the Guidelines[2].

13.3 Marinas, Docks and Fuel Systems

The foremost deficiencies at the concessionaire marinas include the wide use of non-encapsulated foam billet floats. The floats generally have been in use for a long period, have undergone significant deterioration and do not meet the current guidelines for docks. There is water absorption and deterioration in many of the floats, and they cannot retain a consistent freeboard with the main walkways in many cases. It appears that because of this deterioration, many of the finger piers and walkways do not provide adequate freeboard per the California Boating and Waterways Guidelines. The recommended freeboard is 15 to 20 inches, with the lower end being used to prevent water overtopping of the deck when the design live load is applied.

It is understood that for the future improvements at the resorts, Reclamation wishes to use encapsulated foam billets as flotation for the docks. There is a general trend away from the use of exposed flotation billets because of the environmental impact due to their deterioration fouling the waterways. The Oregon State Marine Board has adopted their use as mandatory for new dock construction. The California Boating and Waterways Guidelines state that flotation devices that use new expanded polystyrene (EPS) must have an encasement around the flotation material. The encasement material may be a solid polyethylene pontoon. The encased foam material, called "bead-board" is an open-cell foam. The Guidelines do not recommend exposed foam for public projects. The Guidelines also state the fuel docks must have the encasement to prevent degradation from gasoline spills.

Many of the docks have not been recommended for further use due to the cost involved with upgrading them with encapsulated foam billets and new decking. It is more economical to use a new dock that meets current guidelines and Reclamation's specifications.

The majority of the decking material used on the docks is timber. It appears to have been in place for a long period of time and is showing deterioration due to the environment. Another common problem noted is the pulling out of fasteners in the decking. The timber used for the decking is probably not pressure treated and is succumbing to the ultraviolet rays and the wave action.

The gangways and access ramps for many of the docks are generally in poor condition due to their flotation material and decking. Most do not meet the specified criteria for the handrails or securing lines.

Several of the docks do not meet dimensional criteria per the California Boating and Waterways *"Layout and Design Guidelines for Small Craft Berthing Facilities*". The finger piers do not meet the recommended width criteria for the berth length.

Many deficiencies in the fueling systems were noted relative to today's code. Most common was piping that used improper materials and is inadequately supported. Other issues included lack of filling procedures/alarm and/or containment at the shore tank and minor leaks.

A preliminary estimate has been made to approximate the cost associated with bringing the marina facilities up to current guidelines and standards, taking into consideration the Bureau's desired future plan for the seven Concession areas. The Cost Estimate is located in Appendix D.

13.4 Roads/Parking Lots

This section contains our conclusions and recommendations for repair/modification necessary to bring roadways into substantial compliance with applicable codes and guidelines and to extend the life of existing roadways by approximately 20 years. These recommendations are based on statistical sampling and a visual, reconnaissance level review of site conditions. Final design for any of these features should include physical testing of pavements, an accurate survey of all roadways, traffic estimates, and more detailed engineering evaluations.

13.4.1 Pavement Geometry.

We recommend modifying existing roadway geometry only where safety related problems are identified. Those areas include:

- *Road width.* Two-way roads that are narrower than 18 feet should be widened or changed to one-way roads. Exceptions may be made for driveways that serve only a few dwelling units. Minimum four foot wide shoulders should be provided wherever possible.

- *Curvature.* Horizontal curves should have a minimum centerline radius of 50 feet. Existing curves that are sharper than this should have their curvature reduced, or else the width of shoulders should be increased, to provide adequate fire truck access.

- *Parking and Turnarounds.* All two-way roads that are less than 28 feet wide should be posted "No Parking" on both sides. Virtually all roads are less than 28 feet wide. All one way roads that are narrower than 16 feet should be posted "No Parking" on both sides and should have turnouts at least every 500 to 1000 feet. Most one-way roads are narrower than 16 feet. All dead end roads (including driveways) that are longer than approximately 200 feet should have a fire truck turnaround.

Because this criteria will eliminate most parking on road shoulders, in many areas the existing housing density will be too high for the amount of available parking. Typically a minimum of two parking places should be provided for every dwelling unit. Assessment of the number of parking spaces that are necessary or available in each resort was not performed as a part of this study. However, we did note areas where the absence of parking spaces was particularly acute,

resulting in cars being parked on roads or road shoulders in a manner that seriously obstructs traffic and could prevent fire truck access in an emergency.

- *Striping.* All two-way roads should be painted with a center stripe to direct traffic during foggy or adverse weather.

- *Signing.* All roads should be signed to reflect speed limits, parking restrictions, one way traffic, intersections and similar items.

Detailed recommendations for specific road segments are contained in the resort specific sections of this report. *We emphasize that our work considers only paved roads that serve more than three or four dwellings. Serious concerns regarding fire truck access exist with regard to some dwellings on gravel roads or short driveways. We recommend that the Fire Marshal provide a more detailed inspection of access to all dwellings.*

13.4.2 Pavement Thickness

The remaining live of existing pavements is estimated to range from near zero to approximately eleven years. To achieve a design life of 20 years all existing pavements require rehabilitation varying from overlays to complete reconstruction. Calculated thickness for new pavements are contained in Section 3.4.5. For calculating rehabilitation measures we assigned the following pavement equivalencies to the existing pavements.

PCI of Existing Pavement	New pavement section that would be approximately equivalent to the existing aged section	
	AC	AB
60-80	1”	9”
40-60	0.5”	9”
10-40	0”	9”
0-10	0”	6”

For pavements where the PCI is greater than 40, we recommend the following:

- Excavate areas of severe alligator cracking, rutting or depression.
- Repair these areas with compacted crushed rock and a one-in thick AC patch.
- Apply an AC overlay on all roadways (including the patched areas). The thickness of the overlay is determined by the road classification and the PCI.

For pavements where the PCI is less than 40, we recommend the following:

- Excavate areas of severe alligator cracking, rutting or depression.
- Repair these areas with compacted crushed rock.
- Apply an AC overlay that is roughly equivalent to a new pavement thickness (existing roadway is assumed to provide support equivalent to an aggregate base layer).

In Markley Cove Resort, where most pavements appear to consist of less than one inch of asphalt or macadam with little or no aggregate base, we recommend constructing essentially new pavements, assuming that the existing roadways provide support equivalent to no more than approximately six inches of aggregate base. These recommendations are summarized in the following table:

Recommended Pavement Rehabilitation				
Resort	**Area**	**PCI**	**% High Severity Distress**	**Recommended Repair**
Putah Creek	Collector Roads	46	2.2	Patching + 2.5" Overlay
Putah Creek	Secondary/East of Knoxville Rd	40	7.5	Patching + 1.5" Overlay
Putah Creek	Secondary/West of Knoxville Rd	78	0	Patching + 1" Overlay
Rancho Monticello	Collector Roads	21	19	3" Overlay
Rancho Monticello	Secondary Roads	25	12	2" Overlay
Lake Berryessa Marina	Collector Roads	43	8.5	Patching + 2.5" Overlay
Lake Berryessa Marina	Secondary Roads	42	17.1	Patching + 1.5" Overlay
Spanish Flat	Collector - to Store	34	4.7	3" Overlay
Spanish Flat	Collector - Other	68	0	Patching + 2" Overlay
Spanish Flat	Secondary Roads	62	8.1	Patching + 1" Overlay
Steele Park	Collector - Entry	12	19.2	3" Overlay
Steele Park	Collector - Other	66	4.6	Patching + 2" Overlay
Steele Park	Secondary Roads	68	0.5	Patching + 1" Overlay
Pleasure Cove	Collector Roads	32	13	3" Overlay
Pleasure Cove	Secondary Roads	25	24.2	2" Overlay
Markley Cove	Collector Roads	5	>50	3" AC/3"AB
Markley Cove	Secondary Roads	9	>50	2"AC/2"AB

13.5 Preliminary Site Assessments

The Kleinfelder team conducted a preliminary environmental survey regarding known or suspected releases of hazardous substances at each of the resorts. A Recognized Environmental Condition is defined by the American Society of Testing and Materials (ASTM) *Standard*

Practice for Phase I Environmental Site Assessments, *Phase I Environmental Site Assessment Process* (E1527-00), as "the presence or likely presence of hazardous substances or petroleum products under conditions that indicate a release into structures on the property or into the ground, groundwater or surface water of the property." Interviews with key resort staff was performed to gain an understanding of what processes are utilized at each resort and to document area of potential environmental concern. A checklist form was used for the Preliminary Environmental Survey. Results of the environmental survey did not reveal significant concerns with regards to hazardous materials. Hazardous findings were limited to paints, oils, used oil being recycled, and small quantities of pesticides/herbicides/insecticides. The larger environmental concerns are with the sewage systems.